



Castilleja linariifolia

Castilleja

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Wyoming SNOW-and-Tell

Mountain snowpack is a major source of river water and groundwater across Wyoming (Knight 1994), so snowpack conditions provide an inkling of the growing-season-to-come. The volume of water in snow cannot be predicted from snow depth alone because it can be wet or dry. To gauge water supplies for irrigation and reservoirs, the Natural Resource Conservation Service and Bureau of Reclamation routinely monitor both the depth and water content of snow in a mountain network of 89 Snow Telemetry (SNOTEL) sites across the state.

Table 1. Wyoming Snowpack Summaries, from: <http://www.wcc.nrcs.usda.gov/snowcourse/sc-snowpack.html>) for 1 March 2014

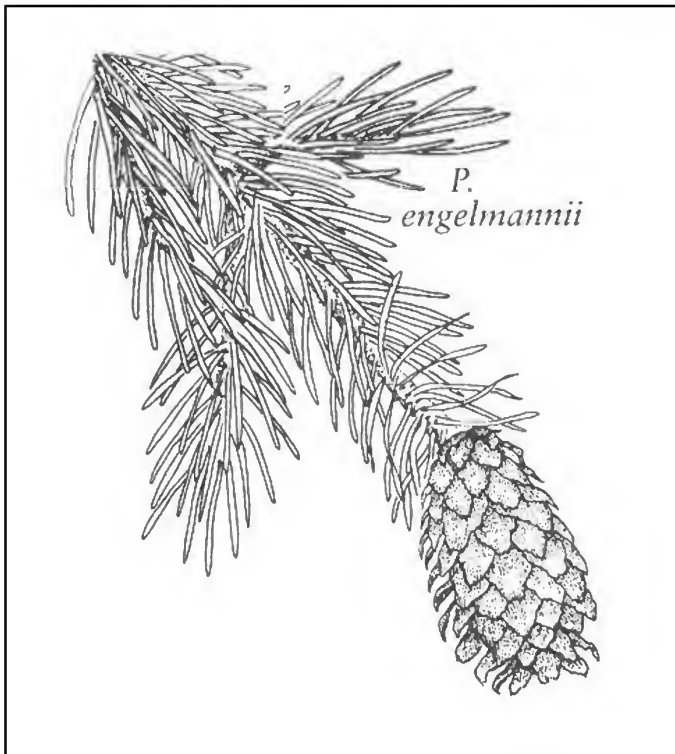
| Area of Wyoming | % of last year | % of median |
|-----------------|----------------|-------------|
| Northwest | 149 | 134 |
| Northeast | 152 | 139 |
| Southeast | 163 | 126 |
| Southwest | 160 | 131 |

As of 1 March 2014, all corners of Wyoming show above-average SNOTEL snowpack, and the contrast is even greater in drawing direct comparisons between the current winter and the past one (Table 1). All major watersheds are well above average in spite of isolated exceptions. (Cont. p. 3)

Engelmann spruce – the Man Behind the Tree

George Engelmann (1809-1884) was regarded as the great American authority on conifers of his time, and was a proponent of the radical new view that gymnosperms are separate from and more primitive than angiosperms. The naming of a tree in his honor, Engelmann spruce (*Picea engelmannii* Parry ex Engelmann), was fitting in the eyes of Asa Gray, who wrote:

"The splendid Spruce, the fairest of them all, which bears the name of Engelmann, will still, it is to be hoped, cover with noble forests the highest slopes of the Rocky Mountains, recalling to men, as long as the study of trees occupies their thoughts, the memory of a pure, upright, and laborious life."
(Sargent 1889; cited in Williams 2003). Cont. p. 10



Picea engelmannii, by Bobbi Angell. From: Taylor, R.J. 1993. *Picea*. Pages 369-373. In: Flora of North America Editorial Committee, ed. *Flora of North America, North of Mexico*. Volume 2. Pteridophytes and Gymnosperms. Oxford University Press, New York, NY.

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WYNPS News

BY-LAWS AMENDMENTS PASS: All the proposed amendments passed - many thanks to all who voted. The revised by-laws will be available on the website Officers page.

YOU CAN RENEW ON-LINE: Membership renewals can now be done through PayPal on the homepage (www.wynps.org), an option that makes it easier than ever!

2014 ANNUAL MEETING: Mark your calendars for the 2014 Annual Meeting! We will meet the weekend of **June 20-22**. A Saturday, 21 June event, offering both bioblitz and tours, will be at Red Canyon in collaboration with The Nature Conservancy and Wyoming Audubon! Watch for more information online and in the next newsletter.

WELCOME TO NEW WEBMASTER: In January, Brenna Marsicek took the helm of our homepage, getting our By-Laws posted and setting up electronic voting. Contact her at brennamarsicek@gmail.com. She took over from Melanie Arnett who got the homepage up and running - THANK YOU both!!

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073

WYNPS Board – 2014

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(dtuthill@uwyo.edu)
Vice-President: Karen Clause, Pinedale
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(waltola64@gmail.com)

2014 FIELD TRIPS: Please contact your nearest chapter or the newsletter editor if you are planning a 2014 Wildflower Field Trip. We simply need date, time, location, plants to be sought, distance, difficulty, and any special instructions; needed before 1 May. Hike offerings will be on the homepage and mailed.

NEW MEMBERS: Please welcome the following new members to WYNPS: Joyce Batson, Jackson; Jeanne Brown, Pinedale; Patricia Cavicchioni, Jackson; Jackson Hole Llamas, Jackson; Robby McMinn, Hillsboro, KS; Debra Patla, Moran; Jeffrey Rose, Madison, WI; Francis Leland Russell, Wichita, KS; Tanya Skurski, Lander; Steve Swan, Jackson; Ellen Wheeler, Cheyenne.

Treasurer's Report: Balance as of 9 February 2014: Scholarship = \$2,015.50; General = \$5,524.89; Total = \$7,540.39.



CHAPTER CORNER

The next Teton Chapter program is: **Tuesday, March 25, 6:00 p.m. "A Walk Around Wyoming, Rare Wildflowers."** Charmaine Delmatier, botanist, will lead a virtual journey across landscapes of Wyoming, highlighting rare flowers. **Where:** Teton Co. Library Ordway Auditorium, 125 Virginian Lane, Jackson. For more information, see: tetonplants@gmail.com.

The new Sublette Chapter is embarking on a 21-month journey! Once-a-month family and key reviews are taking place over winter noon hours, getting to know 21 of the more familiar Wyoming plant families. These herbarium noon hours are open to one and all (bring your own lunch), and have been running on the 3rd Thursday of the month, at the BLM Pinedale Field Office in the Conference Room, lead by Julie Kraft and Karen Clause. For more information, contact Julie (jewelyjoe@hotmail.com).

Editor: Bonnie Heidel (bheidel@uwyo.edu)

Webmaster: Brenna Marsicek
(brennamarsicek@gmail.com)

Sublette Chapter: Julie Kraft, President
(jewelyjoe@hotmail.com)

Teton Chapter: Amy Taylor, Treasurer – see website <http://tetonplants.wordpress.com/> or email (tetonplants@gmail.com)

Bighorn Native Plant Society: P.O. Box 21, Big Horn, WY 82833 (Jean Daly, Treasurer)

The Next Deadline: Please send articles and announcements for the May issue by 16 April.

Contributors to this Issue: Ann Boelter, Robert Dorn, Bonnie Heidel, Yelena Kosovich-Anderson, Julie Kraft, and Amy Taylor.

**New variety of *Astragalus hyalinus*
(summer milkvetch)**

Astragalus hyalinus M.E. Jones var. *glabratus* Evert ex Dorn is the newest addition to the state flora (Dorn 2014), with a story behind it. Erwin Evert first discovered a population of *Astragalus hyalinus* (summer milkvetch) in 1981 at the northwest edge of the species' range. He noted that the dorsal surface of the petals were glabrous unlike the typical variety which has the dorsal surface of the petals conspicuously villous.

In Evert's annotated catalog and atlas of plants of the Yellowstone area (Evert 2010), he treated these plants as "++*Astragalus hyalinus* Jones var. *glabratus* undescribed variety." The double plus meant a taxon endemic to the Greater Yellowstone area. Evert was tragically killed by a grizzly bear after completing his publication in 2010. In his stead, Robert Dorn

validated the name that Evert provided, adding description and recognition of type specimens.

Variety *glabratus* tends to have fewer ovules (6-8 vs 8-9) in addition to the glabrous surface on the back of petals. It was included in the *Astragalus* key of Dorn (2001) as an undescribed taxon on p. 202. Otherwise it matches *Astragalus hyalinus*, a species that is distinguished from other 3-leaflet mat-forming milkvetches by the long calyx tube, 5.5 mm or more long, and the fiddle-shaped banner, in addition to the relatively late blooming period. The new variety is known only from Park County, Wyoming, in foothills west of Cody.

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Evert, E. F. 2010. Vascular Plants of the Greater Yellowstone Area: Annotated Catalog and Atlas. Park Ridge, IL.



Continued from p. 1

How does a SNOTEL site work? Here's one example:
(From: <http://www.wcc.nrcs.usda.gov/snow/>)

The Natural Resources Conservation Service (NRCS) has a SNOTEL site at 3115 m elevation near Brooklyn Lake that remotely samples all precipitation, the minimum, maximum and average temperature, snow depth, and water content.

A typical SNOTEL remote site consists of measuring devices and sensors, a shelter house with an antenna for the radio telemetry equipment, and solar panels used to keep batteries charged. A standard sensor configuration includes snow pillows, a storage precipitation gauge, and a temperature sensor. The snow pillows are envelopes of stainless steel or synthetic rubber containing an antifreeze solution. As snow accumulates on the pillows, it exerts pressure on the solution. Automatic measuring devices in the shelter house convert the weight of the snow into an electrical reading of the snow's water equivalent--that is, the actual amount of water in a given volume of snow. From:
<http://www.fs.fed.us/rm/boise/AWAE/experimentalforests/glees.html>

Reference (for article on p. 1)

Knight, D.H. 1994. Mountains and plains: the ecology of Wyoming landscapes. Yale University Press. 338 pp.

Ongoing Inventory of Wyoming's Flora

By Robert Dorn

When I began working on the Wyoming vascular flora in 1969, there were not enough collections to assign county distributions to the various taxa in any meaningful way. To do so would have given a false impression of their actual distributions. As a result, in my *Manual of the Vascular Plants of Wyoming* (Dorn 1977) I used quadrants of the state (NW, SW, NE, SE) to indicate known distributions. By 1988, with the extensive collecting by Ron Hartman and his students and Ernie Nelson at the Rocky Mountain Herbarium, there were enough collections to meaningfully use 10 areas (NW, NWC, NEC, NE, CW, C, CE, SW, SC, SE) for assigning distributions in the first edition of *Vascular Plants of Wyoming* (Dorn 1988). I attempted to include mountains and either plains or basins in each area and used county lines for boundaries. By the third edition (Dorn 2001), the collections were finally adequate to meaningfully use counties for distribution purposes.

It has now become more challenging to find new county records so we are ready to advance to the next stage in our inventory of the state's flora by using latilongs to document distributions. Latilongs are blocks of 1 degree of latitude by 1 degree of longitude, roughly 70 x 50 miles. These were introduced for bird distributions by P. D. Skaar at Montana State University (Skaar 1969, 1975) and used by Diem (1976) in Wyoming for the first time. The disadvantage of counties is that they represent very different sized areas and often have irregular boundaries. Latilongs are roughly equal in area and have the same shape. There are 28 latilongs in Wyoming (see map at end). Those along the eastern border are slightly smaller and those along the western border slightly larger because the state's borders do not exactly correspond to the 104 degree and 111 degree longitude lines. In addition, those in the north are slightly smaller than those in the south because of the geometry of a sphere. For all practical purposes, they are roughly equal in size and shape. A GPS conveniently tells you which latilong you are in.

I have recently begun concentrating on latilongs 20, 21, and 28 since they are close. If you are into collecting herbarium specimens, you might consider picking a latilong to concentrate on. We can

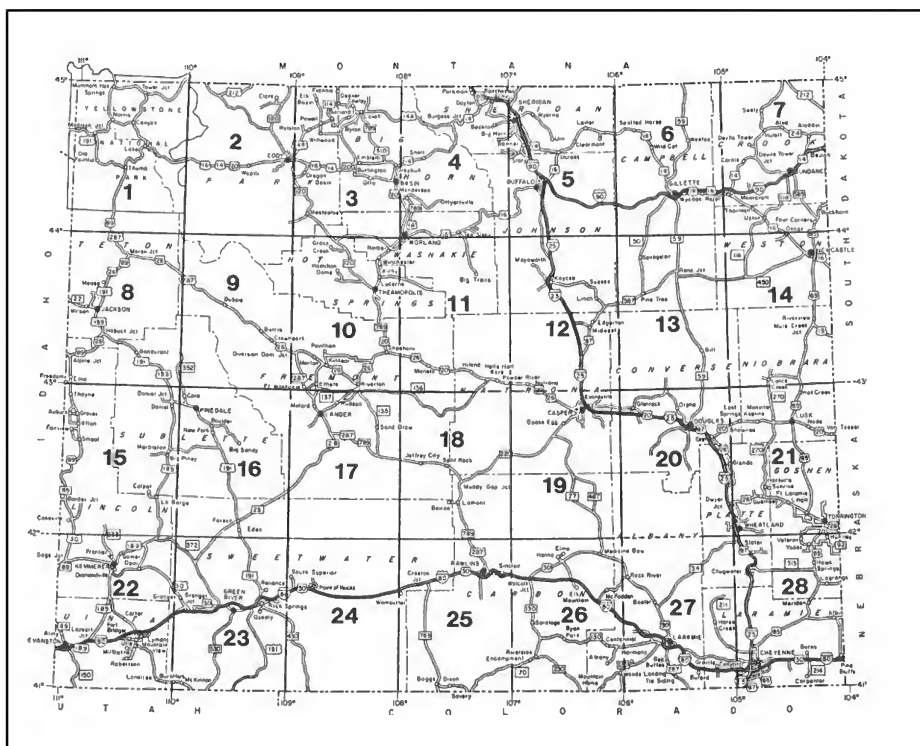
call this "Adopt a Block." You can either try to collect every plant species and variety you can find in the block, or, you can generate a known species/variety list for the block and collect only plants that have not yet been collected in the block. Generating a species/variety list is relatively easy. I will illustrate the process with an example. You only need internet access to the Rocky Mountain Herbarium database online (www.rmh.uwyo.edu).

The most efficient way to generate a species/variety list is to take it a step at a time. I will use latilong 21 as an example. By looking at the map of latilongs, we can see that parts of four counties are within the latilong: Converse, Goshen, Niobrara, and Platte. Start with the county that is likely to have the most species within the latilong, Goshen in this case since it has a larger area than Platte and Converse and has more species than Niobrara. In the Rocky Mountain Herbarium website, click on "RM Specimen Database," insert Wyoming in the state space and Goshen in the county space and click on "Show Checklist" to generate a species checklist. Next go to the right side of the screen where it says "Download as:" and click on rtf and save the list to your computer. You should then be able to print out the list. To save paper, select the entire list, change the font size to 8, and select 2 columns from the column icon. Next, by looking at a map that has townships, ranges, and sections as well as latitude and longitude we see that latilong 21 includes townships 24 through 35 (but only the south half of 35, that is sections 19 through 36) and ranges 60 through 68 (but only the east half of 68, that is sections 1-3, 10-15, 22-27, and 34-36).

Now go to the Rocky Mountain Herbarium website, click on "RM Specimen Database," insert Wyoming in the state space and Goshen in the county space, and enter and search one at a time each species or variety from your checklist. If you find a collection for a given species or variety whose location is within the townships and ranges outlined above (or is within 42° N and 104° W), that constitutes a record for the latilong. Collections with only a landmark location can be checked against a map to see if they are within the latilong. If you do not find a collection in the outlined area, then all collections will be in another latilong (28 in this case). After the Goshen County list is searched, start over with another county, say Niobrara, and do the same thing. You can ignore the species or varieties

that you already found a record for in the latilong 21 part of Goshen County. After Niobrara County is searched, do Platte County ignoring species and varieties already recorded for the latilong portion of Goshen and Niobrara counties. Finally, do the same for Converse County. Now you should have a good approximated list of collections for latilong 21.

Based on my lists for latilongs 20, 21, and 28, expect between 700 and 1000 species for a latilong. Latilongs with mountains will have more species than those without mountains. Deliver your properly labeled specimens to the Rocky Mountain Herbarium to be added to their database. Locations in latitude and longitude are desirable on the labels.



The 28 latilongs of Wyoming (Dorn & Dorn 1999)

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Plant-Collecting Pointers for Charles Darwin

(The following was written by J.S. Henslow and sent to Charles Darwin during the voyage of the Beagle. Quoted from: D.M. Porter, 1986. Charles Darwin's vascular plant specimens from the voyage of HMS Beagle, Botanical Journal of the Linnean Society 93:1-172. [reprinted from Chinquapin 21(4)]).

"Most of the plants are very desirable to me. Avoid sending scraps. Make the specimens as perfect as you can - roots, flowers and leaves and you can't do wrong. In large ferns and leaves fold them back upon themselves on one side of the specimen and they will get into a proper sized paper. Don't trouble yourself to stitch them [to the paper] - for [they] really travel better without it, and a single label per month to those of the same place is enough except that you have plenty of spare time or spare hands to write more."

...More current and detailed instructions are provided on the Rocky Mountain Herbarium homepage (<http://www.rmh.uwyo.edu/about/policies.php#services>)

Bryophyte Inventory Bonanza

By Yelena Kosovich-Anderson

Two remarkable events coincided in my life as a field botanist in September, 2013: I collected my 17,000th bryophyte voucher specimen in Wyoming, and it's also been 10 years since I made my first collecting trip across this state.

The past decade has been a very exciting time for me. It was spent exploring the flora of the least-studied group of higher plants, bryophytes, in the most remote corners of majestic mountain country of Wyoming. My task was very inspiring and motivating but also quite challenging. I clambered over outcrops of ancient granite rocks at Vedauwoo to pick up the beautiful star-like moss *Syntrichia*, crawled long

hours on the alpine tundra of the highest peaks of the Snowy Range in search of the rare and tiny arctic-alpine moss *Stegonia*, slogged through the subalpine fens of the Wind River Range to find three-rowed *Meesia*, hiked miles in the Laramie Mountains to finally discover the



Syntrichia ruralis, by
Y. Kosovich-Anderson

wonderful gigantic form of the rare water moss *Scouleria* on wet shaded boulders in Friend Creek... Following meticulous specimen processing (cleaning-packing-labeling) and subsequent close-up studies, I plunged into lab research... micropreparations, cross-sections, determinations, and if very lucky, possibly new discoveries... I was on the road and camping in summer, and glued to the microscope and piles of identification guides and monographs in winter. For the last decade, this kind of schedule has been my mode of life. Today, marking my seventeen thousandth collection, I am happy to report on my long-term collecting efforts in Wyoming and creation of a large and representative collection of bryophytes for what was formerly one of the least bryologically explored states in the country.

My bryological work in Wyoming started in 2003, as a part of advanced courses in botany and environmental studies at the University of Wyoming

(UW) Botany Department, Laramie, WY, and research at the UW Rocky Mountain Herbarium. They were organized under the auspices of the Junior Faculty Development Program. Upon finishing this program, after some pause in my field research, I returned to conducting bryophyte floristic inventories in Medicine National Forest on a voluntary basis. Beginning in 2008 and continuing up to the present, I have conducted bryophyte floristic inventories on Shoshone National Forest, with US Forest Service support as a Wyoming Natural Diversity Database contractor. Later in 2013, I received the Markow Grant from Wyoming Native Plant Society to fill the key gaps in documenting the bryophyte flora of the Medicine Bow National Forest (see my article in the December 2013 issue of *Castilleja*).

Quick facts about the author's herbarium

- * The total number of voucher specimens is over 17,000, including roughly 1,000 specimens of liverworts. The Herbarium contains about 20,000 fully processed duplicates (for exchange and as a part of the author's private herbarium). One advantage of a modern herbarium like this is that each specimen label contains detailed GPS location data.

- * Geography of collections. The nucleus of the Herbarium consists of specimens from mountains of southern Wyoming (Pole Mts., Laramie Mts., Sierra Madre, and Medicine Bow Mts., including the peaks of Snowy Range), west-central Wyoming (Wind River Range), and northwestern Wyoming (Beartooth Mts.). The bryophyte flora of the high plains (mainly from the south-east of the state) is less well represented in the Herbarium. Collections to date span eleven counties: Albany, Carbon, Converse, Crook, Fremont, Hot Springs, Laramie, Natrona, Park, Platte, and Teton.

- * New data. The first annotated checklists on the bryophytes of the Shoshone National Forest (in the Beartooth Mts. and the southeastern portion of the Wind River Range) and the Medicine Bow National Forest have been completed. Up to the present, the author's Herbarium investigation has documented 14 moss species and 4 genera that are additions to Wyoming flora; one species is new to the North American continent, one variety is newly described. The new state distribution information is being incorporated into Volume 28 of *Flora of North America* (in press) and results also provide a framework for understanding county distribution.



Above: The author studying specimens. Bryophyte species require specially-prepared slide mounts for positive identification and can be identified only under the microscope.

Duplicate specimen of some taxonomic groups are also deposited at:

- ASC (Northern Arizona University, Flagstaff, AZ),
- BING (State University of New York, Binghamton, NY)
- BONN (University of Bonn, Bonn, Germany)
- CAS (California Academy of Sciences, San Francisco, CA),
- COLO (University of Colorado Museum, Boulder, CO),
- DUKE (Duke University, Durham, SC),
- H (University of Helsinki, Helsinki, Finland),
- MHA (Main Botanical Garden, Russian Academy of Sciences, Moscow, Russia),
- MO (Missouri Botanical Garden, Saint Louis, MO),
- MONTU (University of Montana, Missoula, MT),
- S (Swedish Museum of Natural History, Stockholm, Sweden)
- US (United States National Herbarium/Smithsonian Institution, Washington DC.)
- VBG (Botanical Garden-Institute, Vladivostok, Russia).

My collections are being added to the on-line database of the Rocky Mountain Herbarium and included in a nationwide data base of the bryophytes of the major herbaria.

*Editor's Note: Wyoming may be better represented in the next two bryophyte volumes of the **Flora of North America** thanks to work by the author. For more information on bryophytes (mosses and liverworts), see the Bryophyte Flora of North America.*
<http://www.mobot.org/plantscience/bfna/bfnam>.

Acknowledgements

The help of many people, especially my local colleagues, is highly appreciated. The following individuals made my field research in Wyoming possible: Ronald Anderson (volunteer), Kent Houston and Kathy Roche (U.S. Forest Service), Ron Hartman (UW Rocky Mountain Herbarium), Ann Boelter (Wyoming Native Plant Society) and Bill Weber (University of Colorado Museum). I wish to thank them for their support. My gratitude is extended also to all of my bryology colleagues, who understand the challenges and importance of this kind of research, and who encouraged my work in Wyoming. It is my privilege and honor to create a herbarium documenting the state bryophyte flora for further taxonomic, ecological, phytogeographical studies in the Rocky Mountain region. I thank Ron Wittmann for reading the first version of this manuscript and making necessary corrections.

Publications and technical reports, based on author's herbarium:

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Growing Native Plants

Part 11. Annual Forbs

By Robert Dorn

Annual forbs are used mostly for flower beds, planters, or pots that are changed every year. They can also be used to get a flower display the first year of planting. Some annuals readily reseed themselves but others need to be replanted by hand. To see the following five examples in color, go to the Society website.

Cleome serrulata, Purple Beeplant, can grow to 6 feet tall and wide with a thick stem and large taproot. Most commonly it is 3 feet or less tall. The leaves are compound with 3 narrow leaflets each to 3 inches long. The flowers are pale pink to lavender, rarely white, to 1 inch across, and clustered at the tips of the many stems and branches. They bloom for a relatively long period between July and September.



Cleome serrulata, Goshen County

The flowers are exceedingly attractive to bees. Many of these bees may be important pollinators of fruit trees and other crops. Beeplants may keep your bees happy for the rest of the summer after the fruit trees are pollinated in the spring. An unresearched question is whether they draw the bees away from pollinating crops or whether they attract more bees to an area so that more crop plants get pollinated. The seeds are much sought after by birds, especially Mourning Doves. The plants occur naturally in disturbed, especially sandy areas in the valleys, plains, and basins. They prefer full sun and well drained soils and are drought tolerant. They self seed

readily if the birds and rodents don't get all of the seeds. They are easy to grow from seed. Sow seed in the fall and cover with ¼ inch of soil. If sown in spring, cold stratification for 60 days beforehand may help germination. Seed is commercially available.

Euphorbia marginata, Snow on the Mountain, grows to 2 feet tall and 8 inches wide. The leaves are up to 4 inches long and about half as wide, the lower usually blue-green and the upper with increasing amounts of white on their margins, the uppermost almost entirely white with a green midrib. The flowers are inconspicuous. The plants are grown for the leaf appearance which resembles a white poinsettia. The seed capsules explode spreading seeds widely, but being an annual, the plants are easy to keep controlled. The plants occur naturally in disturbed areas on the plains. They prefer full sun or light shade and loose, well drained soils. The plants are considered poisonous and some people develop a rash when their skin is exposed to the milky juice. They are easily grown from seed sown in spring. It is also in the nursery trade.



Euphorbia marginata, Crook County

Helianthus annuus, Annual Sunflower, grows to 6 feet tall and half as wide. The leaves are up to 12 inches long and half as wide and somewhat triangular. The flowers are the true sunflower with a circle of yellow rays surrounding a center of brownish disk flowers. The flower heads are to 3 inches across or occasionally larger with one to few at the tips of stems and branches. It flowers from July to September. The seeds are highly sought after by birds, especially if the plants are left standing into winter. If you plan to grow other species on the site

in the following year, remove the plants including roots in late fall since the remains can inhibit other plants. The plants occur naturally in disturbed areas in the basins, valleys, and plains. They prefer full sun and loose, well drained soils. They are easy to grow from seed. There are many cultivars in the nursery trade.



Helianthus annuus, Goshen County

Lupinus pusillus, Small Lupine, grows to about 10 inches tall and as wide. The leaves are compound with mostly about 7 narrow leaflets arising from the same point. The flowers are typical pea flowers that are purple and marked with white and clustered along the upper part of the stems. Blooming is from May to July or August. The plants occur naturally in the valleys, basins, and plains. They prefer full sun and sandy soil. Sow seed about ¼ inch deep after scarification either in fall or spring.

Machaeranthera tanacetifolia, Tanseyleaf Spinyaster, grows to about 18 inches tall and 12 inches wide. The leaves are finely dissected and to 2.5 inches long. The flowers are sunflower-like but smaller, the rays light blue to lavender and the central disks yellow, the flower heads up to 1.5 inches across with many heads per plant at the tips of stems and branches. It has a long blooming period from July to September. The plants occur naturally in dry open areas of the plains and basins often in disturbed or sandy soils. They prefer full sun and dry, well drained, loose soil. It can be grown easily from seed which is commercially available.



Lupinus pusillus, Goshen County



Machaeranthera tanacetifolia, Goshen County

Fungus Flowers

(Editor's note: Here is the answer to a repeated "what's this" question.)

In early spring you may find what looks like a small, showy yellow flower among the sagebrush. Look more closely and you will see that these flowers are really the rust covered leaves of rockcress (*Arabis/Boechera* spp.) Rockcress is normally a tall, slender wild mustard with white or lavender flowers. Rocky Mountain Biological Laboratory researcher Dr. Barbara Roy has found that the bright yellow rust, a kind of fungus, mimics flowers both with its color and by causing the host plant to alter the growth of its leaves so that they are clustered like petals. The rust also exudes a sweet fluid that flies feed on. Pollinating flies that normally visit true yellow flowers are fooled and attracted to the flora mimics, thereby facilitating reproduction of the rust, which then produces spores that disperse by wind to infect other plants. From: Darrow, K. 2006. *Wild About Wildflowers*. WildKat Pub. Co., Glendale, AZ.

Engelmann – cont. from p. 1

George Engelmann came to the United States as a 23-year old German immigrant with a newly-minted medical degree and unrealized passion for botany. He set out with a horse and a gun as a land scout, later to sell them to start what became a thriving medical practice in Saint Louis, MO "...that would support his intellectual interests for the remainder of his life" (Williams 2003). In his scholarly botany work, breadth of botanical interest, and central location, he became "...a veritable crossroads between East and West" (Williams 2003) and intermediary between field botanists and academicians, nationwide and beyond. As such, he built a major personal herbarium, championed the creation of Missouri Botanical Garden, and wrestled with some of the most daunting taxonomic groups of his adopted country.

References

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Williams, R.L. 2003. *A Region of Astonishing Beauty – The Botanical Exploration of the Rocky Mountains*. Roberts Rinehart Publishers, Lanham, MD.

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